CLAIMS

What we claim is:

1. A plasmid for expression of recombinant eucaryotic genes comprising:

a first transcription unit comprising a first transcriptional control sequence transcriptionally linked with a first 5'-untranslated region, a first synthetic intron, a first coding sequence, and a first synthetic 3'-untranslated region/poly(A) signal, wherein said first synthetic intron is between said control sequence and said first coding sequence; and

a second transcription unit comprising a second transcriptional control sequence transcriptionally linked with a second 5'-untranslated region, a second synthetic intron, a second coding sequence, and a second synthetic 3'-untranslated region/poly(A) signal, wherein said second synthetic intron is between said control sequence and said second coding sequence.

2. The plasmid of claim 1, wherein said first transcriptional control sequence or said second transcriptional control sequence comprise cytomegalovirus promoter/enhancer sequences.

3. The plasmid of claim 1, wherein said first coding sequence or said second coding sequence encode a therapeutic molecule or a subunit of a therapeutic molecule.

4. The plasmid of claim 1, wherein said first and second transcriptional control sequences are the same.

5. The plasmid of claim 1, wherein said first and second transcriptional control sequences are different.

6. The plasmid of claim 1, wherein said first coding sequence and said second coding sequence comprise a sequence coding for the p40 subunit of human IL-12 and a sequence coding for the p35 subunit of human IL-12.

7. The plasmid of claim 6, wherein said sequence coding for the p40 subunit of human IL-12 is 5' to said sequence coding for the p35 subunit of human IL-12.

8. A plasmid for expression of recombinant eucaryotic genes, comprising an intron having variable splicing, a first coding sequence, and a second coding sequence.

9. The plasmid of claim 8, further comprising:

a transcriptional control sequence transcriptionally linked with a first coding sequence and a second coding sequence;

a 5'-untranslated region;

an intron 5' to said first coding sequence;

an alternative splice site 3' to said first coding sequence and 5' to said second coding sequence; and

a 3'-untranslated region/poly(A) signal.

10. The plasmid of claim 9, wherein said first coding sequence or said second coding sequence encode a therapeutic molecule or a subunit of a therapeutic molecule.

11. The plasmid of claim 9, wherein said transcriptional control sequence comprises a cytomegalovirus promoter/enhancer sequence.

12. The plasmid of claim 8, wherein said first coding sequence and said second coding sequence comprise a sequence coding for the p40 subunit of human IL-12 and a sequence coding for the p35 subunit of human IL-12.

13. A plasmid for expression of recombinant eucaryotic genes comprising:

a transcriptional control sequence transcriptionally linked with a first coding sequence, an IRES sequence, a second coding sequence, and a 3'-untranslated region/poly(A) signal, wherein said IRES sequence is between said first coding sequence and said second coding sequence; and

an intron between said promoter and said first coding sequence.

14. The plasmid of claim 13, wherein said transcriptional control sequence comprises a cytomegalovirus promoter/enhancer sequence.

15. The plasmid of claim 13, wherein said first coding sequence and said second coding sequence comprise a sequence coding for the p40 subunit of human IL-12 and a sequence coding for the p35 subunit of human IL-12.

16. The plasmid of claim 13, wherein said IRES sequence is from an encephalomyocarditis virus.

17. A DNA sequence coding for human IL-12 subunit, comprising a synthetic nucleotide sequence having less than 50% identity to a natural human IL-12 subunit coding sequence.

18. The DNA sequence of claim 17, wherein said synthetic nucleotide sequence comprises a sequence having at least 99% sequence identity to the sequence of SEQ ID NO. 3.

19. The DNA sequence of claim 18, wherein said synthetic nucleotide sequence comprises a nucleotide sequence identical to the sequence of SEQ ID NO. 3 or 4.

20. The DNA sequence of claim 17, wherein said synthetic nucleotide sequence comprises a sequence having at least 99% sequence identity to the sequence of SEQ ID NO. 7.

21. The DNA sequence of claim 20, wherein said synthetic nucleotide sequence comprises a nucleotide

sequence identical to the sequence of SEQ ID NO. 7 or 8.

22. A composition for delivery of a DNA molecule in a mammal, comprising

a cationic lipid with a neutral co-lipid, prepared as a liposome having an extrusion size of about 800 nanometers; and

a quantity of DNA comprising a coding sequence.

23. The composition of claim 22, wherein said DNA is at least about 80% supercoiled.

24. The composition of claim 23, wherein said DNA is at least about 90% supercoiled.

25. The composition of claim 24, wherein said DNA is at least about 95% supercoiled.

26. The composition of claim 22, wherein said cationic lipid and said DNA are present in a negative to positive charge ratio of about 1:3.

27. The composition of claim 22, further comprising an isotonic carbohydrate solution.

28. The composition of claim 27, wherein said isotonic carbohydrate solution consists essentially of about 10% lactose.

29. A composition of claim 22, wherein said cationic lipid is DOTMA and said neutral co-lipid is cholesterol.

30. A composition for delivery of a DNA molecule in a mammal, comprising

a cationic lipid with a neutral co-lipid; and

a quantity of DNA comprising a coding sequence,

wherein said cationic lipid and said DNA are present in a negative to positive charge ratio of about 1:3.

31. The composition of claim 30, wherein said DNA is at least about 80% supercoiled.

32. The composition of claim 31, wherein said DNA is at least about 90% supercoiled.

33. The composition of claim 32, wherein said DNA is at least about 95% supercoiled.

34. The composition of claim 30, further comprising an isotonic carbohydrate solution.

35. The composition of claim 34, wherein said isotonic carbohydrate solution consists essentially of about 10% lactose.

36. A composition of claim 30, wherein said

cationic lipid is DOTMA and said neutral co-lipid is cholesterol.

37. A method for preparing a composition for delivery of a DNA to a mammal, comprising the steps of:

a. preparing a DNA comprising a coding sequence;

b. preparing liposomes having an extrusion size of about 800 nm, wherein said liposomes comprise a cationic lipid and a neutral co-lipid; and

c. combining said liposomes with said DNA in amounts such that said cationic lipid and said DNA are present in a negative to positive charge ratio of about 1:3.

38. A method of treatment of a mammalian condition or disease, comprising administering to a mammal suffering from said condition or disease an amount of a composition for delivery of a DNA molecule in a mammal,

wherein said DNA comprises a coding sequence encoding a therapeutic molecule or a subunit thereof, and

wherein said composition comprises a cationic lipid, a neutral co-lipid, and said DNA, and has a negative to positive charge ratio of about 1:3 for said cationic lipid and said DNA.

39. The method of claim 38, wherein said composition is prepared for administration by ultrasonic nebulization.

40. The method of claim 38, wherein said DNA comprises two coding sequences which encode human IL-12 p40 and p35 subunits.

41. The method of claim 38, wherein said disease or condition is asthma.

42. The method of claim 38, wherein said disease or condition is a cancer.

43. A vaccine adjuvant comprising a cationic lipid, a neutral co-lipid, and DNA,

wherein said DNA comprises a sequence encoding the p40 subunit of IL-12 and the p35 subunit of IL-12, and

wherein said cationic lipid and said DNA are present in a negative to positive charge ratio of about 1:3.

44. A method of enhancing the response of a mammal to a vaccine, comprising the step of administering to said mammal a vaccine and an adjuvant,

wherein said adjuvant comprises a cationic lipid, a neutral co-lipid, and DNA, said DNA comprising a sequence encoding the p40 subunit of IL-12 and the p35 subunit of IL-12, and

wherein said cationic lipid and said DNA are present in a negative to positive charge ratio of about 1:3.